

### Abstract

A projection optical system comprises a plurality of lenses  
5 disposed along an optical axis of the projection optical system;  
wherein the plurality of lenses is dividable into four non-  
overlapping groups of lenses of positive and negative refractive  
powers, wherein the following relation is fulfilled:

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$$2 \cdot y \cdot NA \cdot \frac{1}{k} \cdot \sum_{i=1}^k |\phi_i| \geq V_1$$

wherein:

15  $y$  is half a diameter<sup>2</sup> in mm of a maximum image field imaged by  
the projection optical system,

$NA$  is a maximum numerical aperture on a side of the second  
object,

20  $\phi_i$  is a refractive power in  $\text{mm}^{-1}$  of the  $i^{\text{th}}$  lens,

$k$  is a total number of lenses of the projection optical system,

and wherein  $V_1$  is greater than 0.045.

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